MELD and PELD Calculators
User Guide

OPTN *Organ Procurement & Transplantation Network*

Contents

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Overview

The model for end-stage liver disease (MELD) and pediatric end-stage liver disease (PELD) calculators allow users to enter hypothetical or actual parameters and calculate a MELD or PELD score for an individual patient.

The MELD and PELD calculators provided on this site use the specific formulas approved by the Organ Procurement & Transplantation Network (OPTN) Board of Directors and used for the allocation of livers by the OPTN match system.

MELD Calculator

The MELD calculator is for transplant candidates whose current age is at least 12 years old.

How to Use the MELD Calculator

1. **Date of birth**: Enter the candidate's date of birth (mm/dd/yyyy).
2. **Date added to the Waiting List**: Enter the date the candidate was added to the waiting list (mm/dd/yyyy). For candidate's not yet on the waiting list, you can use today's date.
3. Enter laboratory values
   a. **Bilirubin** (mg/dL): Enter a value between 0 and 99.
   b. **Serum Sodium** (mEq/L): Enter a value between 100 and 200.
   c. **INR**: Enter a value between 0.5 and 99.
   d. **Serum creatinine (mg/dL)**: Enter a value between 0.01 and 40.
   e. **Albumin (g/dL)**: Enter a value between 0.50 and 9.90 g/dL.
4. **Had dialysis twice, or 24 hours of CVVHD, within a week prior to the serum creatinine test?** Select **Yes** or **No**.
5. **Sex for purposes of adult MELD calculation**: This field is required for candidates who are at least 18 years of age at the time of registration.
   Select **Male** or **Female** in consultation with the candidate and consistent with the following:
   a. Select **Female** if the candidate's sex recorded at birth is female, or if the candidate's sex recorded at birth was male, and, for example, the candidate is currently taking feminizing gender affirming hormone therapy to align with their gender identity.
   b. Select **Male** if the candidate's sex recorded at birth is male, or if the candidate's sex recorded at birth was female, and, for example, the candidate is currently taking masculinizing gender affirming hormone therapy to align with their gender identity.
6. Click **Calculate**.
7. The MELD score displays in the **MELD Score** field.

How the MELD Score is Calculated

When calculating a candidate's MELD score, unrounded values entered for the candidate will be used, with the following adjustments:

- Bilirubin, INR, and creatinine values less than 1.0 are set to 1.0.

- Sodium values less and 125 mEq/L are set to 125 mEq/L, and values greater than 137 mEq/L are set to 137 mEq/L.
- Albumin values less than 1.5 g/dL are set to 1.5 g/dL, and values greater than 3.5 g/dL are set to 3.5 g/dL.
- The following candidates receive a creatinine value of 3.0 mg/dL:
    - Those with a creatinine value greater than 3.0 mg/dL.
    - Those who received two or more dialysis treatments within 7 days prior to the serum creatinine test.
    - Those who received 24 hours of continuous veno-venous hemodialysis (CVVHD) prior to the serum creatinine test.

Candidates who are at least 18 years old at the time of registration receive an initial MELD score equal to

$$1.33 \text{ (if female)} + [4.56 \times \log_e(\text{bilirubin})] + [0.82 \times (137 - \text{sodium})] - [0.24 \times (137 - \text{sodium}) \times \log_e(\text{bilirubin})] + [9.09 \times \log_e(\text{INR})] + [11.14 \times \log_e(\text{creatinine})] + [1.85 \times (3.5 - \text{albumin})] - [1.83 \times (3.5 - \text{albumin}) \times \log_e(\text{creatinine})] + 6$$

Candidates who are currently at least 12 years old and were less than 18 years old at the time of registration receive a MELD score equal to

$$[4.56 \times \log_e(\text{bilirubin})] + [0.82 \times (137 - \text{sodium})] - [0.24 \times 137 - \text{sodium}) \times \log_e(\text{bilirubin})] + [9.09 \times \log_e(\text{INR})] + 11.14 \times \log_e(\text{creatinine})] + [1.85 \times (3.5 - \text{albumin})] - [1.83 \times (3.5 - \text{albumin})] - [1.83 \times (3.5 - \text{albumin}) \times \log_e(\text{creatinine})] + 7.33$$

The minimum MELD score is 6, and the maximum MELD score is 40. The MELD score derived from this calculation is rounded to the nearest whole number. The minimum MELD score is 6, and the maximum MELD score is 40.

PELD Calculator

The PELD calculator is for candidates under the age of 12.

How to Use the PELD Calculator

1. **Date of birth**: Enter the candidate's date of birth (mm/dd/yyyy).
2. **Birth sex**: Select **Male** or **Female**, based on biologic and physiologic traits at birth.
3. Enter the laboratory values
    a. **Bilirubin** (mg/dL): Enter a value between 0 and 99.
    b. **INR**: Enter a value between 0.5 and 99.
    c. **Albumin** (g/dL): Enter a value between 0.50 and 9.90 g/dL.
    d. **Serum creatinine**: Enter a value between 0.01 and 40.
4. **Height**: Enter the candidate's height in either ft (feet) and in (inches), or in cm (centimeters).
5. **Height date**: Enter the date the candidate's height was measured.
6. **Weight**: Enter the candidate's weight in lb (pounds) or kg (kilograms).
7. **Weight date**: Enter the date the candidate's weight was measured.
8. **Had dialysis twice, or 24 hours of CVVHD, within a week prior to the serum**

creatinine test? Select Yes or No.
9. Click **Calculate**.
10. The PELD score displays in the **PELD Score** field.

How the PELD Score is Calculated

When calculating a candidate's PELD score, unrounded values entered for the candidate will be used, with the following adjustments

- Albumin, bilirubin, and INR values less than 1.0 are set to 1.0.
- The following candidates receive a creatinine value of 1.3 mg/dL:
  - Those with a creatinine value greater than 1.3 mg/dL
  - Those who received two or more dialysis treatments within the 7 days prior to the serum creatinine test
  - Those who received 24 hours of continuous veno-venous hemodialysis (CVVHD) within the 7 days prior to the serum creatinine test

Table 1: PELD Score Calculation

	If the value is	Then the value's contribution to PELD is
Candidate age (fractional calendar year)*	<1	−0.1967 x 1
	1 to 5.5	−0.1967 x age at the time of the most recent lab reported for use in the PELD score (fractional calendar year)
	> 5.5 and <12	−0.1967 x 5.5
Albumin (g/dL)	1 to 1.9	−1.842 x ln(albumin)
	> 1.9	−1.842 x ln(1.9)
Total bilirubin (mg/dL)	1 to 4	0.7854 x ln(bilirubin) + 0.3434 x ln(4)
	>4 to 40	0.7854 x ln(4) + 0.3434 x ln(bilirubin)
	>40	0.7854 x ln(4) +0.3434 x ln(40)
INR	1 to 2	1.981 x ln(INR) + 0.7298 x ln(2)
	>2 to 10	1.981 x ln(2) + 0.7298 x ln(INR)
	>10	1.981 x ln(2) + 0.7298 x ln(10)
Minimum of CDC height or weight Z-score**	< − 5.0	−0.1807 x (−5)
	−5.0 to − 2.1	−0.1807 x (minimum z-score)
	>− 2.1	−0.1807 x (−2.1)
Creatinine (mg/dL)	<0.2	1.453 x ln (0.2)
	0.2 to 1.3	1.453 ln(creatinine)
	>1.3	1.453 x ln(1.3)

*Fractional calendar year is computed as the number of days between the date of the most recent lab value reported for use in the PELD score and each candidate's date of birth, divided by 365.25. Unrounded fractional age value (out to 9 decimal places) is entered into the PELD score calculation.
**See the Height or Weight Z-Score section for more information on how the z-score is calculated.

The PELD score is then calculated using the following formula:

((sum of all terms in Table 1: PELD Score Calculation) + 1.5287) x 10 +2.82

The minimum PELD score is 6.The PELD score derived from this calculation is rounded to the nearest whole number. Values below 6 are rounded to 6 in the OPTN system.

Height or Weight Z-Score

The minimum of Center for Disease Control and Prevention's (CDC) height or weight Z-score uses the lambda-mu-alpha (LMS) method and is based on the 2000 CDC Growth Charts for the United States. The calculation uses the candidate's birth sex, most recent values submitted for height and weight, and the candidate's age in months at the time the height and weight values used in the PELD calculation were measured. If height and weight are not measured on the same day, the OPTN Computer System will use the more recent measurement date when calculating the candidate's age for the purposes of the z-score calculation.

In brief, the LMS method allows users to quantify how far a child deviates from the average height or weight for a given reference population in terms of a percentile or z-score (in the case of the 2000 CDC Growth Charts, the reference population was based on data from the National Health and Nutrition Examination Survey, NHANES). To obtain these z-scores, the calculation relies on the CDC's L (normality transformation), M (median), and S (coefficient of variation) reference values at each age, as supplied in the CDCREF_D table.[i] If a candidate's age falls between successive age categories in this reference table, the L, M, and S values are linearly interpolated. The candidate's z-score is then computed by substituting the candidate's height in centimeters or weight in kilograms (X) and the appropriate age-specific L, M, and S reference values into the following equations: $Z = [(X/M)^L - 1]/LS$, if $L \neq 0$; or $Z = \ln(X/M)/S$, if $L = 0$[ii]. Because the height-for-age (HAZ) and weight-for-age (WAZ) z-scores are tied to a particular percentile of the age- and sex-specific reference population, it is strongly encouraged to measure height and weight on the same date.

[i] For details on how these reference values were calculated, see https://www.ncbi.nlm.nih.gov/pmc/articles/PMC27365/, https://pubmed.ncbi.nlm.nih.gov/1518992/, https://www.cdc.gov/nchs/data/nhsr/nhsr063.pdf, and https://www.cdc.gov/nchs/data/series/sr_11/sr11_246.pdf.
[ii] For methodological details, see https://www.cdc.gov/nchs/data/nhsr/nhsr063.pdf and https://www.cdc.gov/nchs/data/series/sr_11/sr11_246.pdf; for sample SAS code, see https://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.htm.